IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
CHAPPAZ

Serial No. **Not Yet Assigned**

Filing Date: **Herewith**

For: **PROCESS AND DEVICE FOR ESTIMATING THE SUCCESSIVE VALUES OF DIGITAL SYMBOLS, IN PARTICULAR FOR THE EQUALIZATION OF AN INFORMATION TRANSMISSION CHANNEL IN MOBILE TELEPHONY**

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DATE OF DEPOSIT: December 3, 2001

NAME: Dawn Kimler

SIGNATURE: Dawn Kimler

PATENT - 5050-4

PRELIMINARY AMENDMENT

Director, U.S. Patent and Trademark Office
Washington, D.C. 20231

Sir:

Prior to the calculation of fees and examination of the present application, please enter the amendments and remarks set out below.

In the Drawings:

Submitted herewith is a request for proposed drawing modifications as indicated in red ink to replace selected words in FIGS. 8 and 12-15.

In the Claims:

Please cancel Claims 1 to 35.

Please add new Claims 36 to 95.

36. A process for estimating successive values of digital symbols based upon successive values of digital samples, with each symbol having M different possible values and each sample resulting from a combination of at most L successive symbols, the process comprising:

progressing stage-by-stage through a trellis of a Viterbi type with M^k states, with k being less than or equal to L-1 and all the states of all the stages being respectively provided with aggregate metrics;

partitioning into M groups all transitions arriving at the various states of a current stage of the trellis when taking into account a sample of rank n, with each group containing all the transitions arising from the states of a preceding stage which are associated with one of the M possible values of a symbol of rank n-k;

calculating the various aggregate metrics for the various states of the current stage of the trellis, and determining in each group one of the transitions which leads to the state provided with an extremum aggregate metric; and

selecting a unique decision regarding the value of the symbol of rank n-k by detecting the group associated with the extremum of these M extremum aggregate metrics, the unique decision being provided with a symbol-confidence index formulated from the M extremum aggregate metrics.

37. A process according to Claim 36, wherein the aggregate metrics are error cues aggregated between observed values and expected values of the samples; and wherein the extremum aggregate metric comprises a minimum aggregate metric.

38. A process according to Claim 37, wherein M is equal to 2; and wherein the detecting comprises calculating a difference between the two minimum aggregate metrics, and a sign of the difference yields a unique decision regarding the value of the symbol of rank n-k, and an absolute value of the difference yields a value of the symbol-confidence index.

39. A process according to Claim 37, wherein M is greater than 2; and wherein the detecting comprises making a first selection of the smallest of the M minimum aggregate metrics; and wherein formulating the symbol-confidence index assigned to the unique decision comprises a second selection from among M-1 remaining minimum aggregate metrics not selected on completion of the first selection of the smallest of the M-1 remaining minimum aggregate metrics, and calculation of a difference between the two minimum aggregate metrics arises respectively from the first and second selections, and a positive value of the difference yields the value of the symbol-confidence index.

40. A process according to Claim 36, wherein the aggregate metrics are resemblance cues aggregated between observed values and expected values of the samples; and wherein the extremum aggregate metric comprises a maximum aggregate metric.

41. A process according to Claim 40, wherein M is equal to 2; and wherein the detecting comprises calculating a difference between the two maximum aggregate metrics, and a sign of the difference yields the unique decision regarding the value of the symbol of rank n-k, and an absolute value of

the difference yields the value of the symbol-confidence index.

42. A process according to Claim 40, wherein M is greater than 2; and wherein the detecting comprises making a first selection of the largest of the M maximum aggregate metrics; and wherein formulating the symbol-confidence index assigned to the unique decision comprises a second selection from among the M-1 remaining maximum aggregate metrics not selected on completion of the first selection, of the largest of the M-1 remaining maximum aggregate metrics, and the calculation of the difference between the two maximum aggregate metrics arises respectively from the first and second selections, and a positive value of the difference yields the value of the symbol-confidence index.

43. A process according to Claim 36, wherein each symbol is formed of b bits and M is equal to 2^b, and a bit-confidence index is formulated for each of the bits of the symbol of rank n-k elected on completion of the unique decision by using an elected symbol and at least one auxiliary symbol formulated from the elected symbol by complementing at least a value of a relevant bit.

44. A process according to Claim 43, wherein formulating the bit-confidence index for a relevant bit of the elected symbol comprises:

formulating the at least one single auxiliary symbol by complementing the value of the respective relevant bit while leaving unchanged the values of the other bits of the elected symbol;

selecting at least one extremum aggregate metric associated with the group of transitions to which the at least one auxiliary symbol belongs; and

determining a difference between the at least one extremum aggregate metric associated with the group of transitions to which the elected symbol belongs and to the at least one extremum aggregate metric associated with the group of transitions to which the at least one auxiliary symbol belongs, and a result of the difference yields the value of the bit-confidence index.

45. A process according to Claim 36, wherein the trellis is a reduced trellis with M^k states, with k being less than L-1; and wherein the states of the current stage of rank n of the trellis correspond to the k symbols of rank n to n-k+1, in that after having selected the unique decision regarding the symbol of rank n-k, one tag containing the values of the symbols of rank n-k to n-L+2 respectively obtained upon the L-k-1 selections of successive unique decisions is associated with all the states of the current stage of the trellis, and in that the aggregate metric of each state of the stage of rank n of the trellis is calculated from a transition metric associated with the transition ending at the state of the stage of rank n and arising from the state of the stage of rank n-1 corresponding to the value of the symbol of rank n-k, contained in the tag, and from the aggregate metric associated with the state of the stage of rank n-1 from which the transition arises.

46. A process according to Claim 36, wherein the stage-by-stage progression through the trellis is conditioned

to the selection of successive unique decisions regarding the values of the symbols.

47. A process according to Claim 36, wherein the progressing, partitioning, calculating and selecting are stored as instructions on a computer readable medium for execution by a processor.

48. A process for equalizing an information transmission channel having an impulse response with L coefficients, the information transmission channel delivering successive digital samples corresponding to successively transmitted symbols, with each symbol having M different possible values, the process comprising:

estimating successive values of the symbols by progressing stage-by-stage through a trellis of the Viterbi type with M^k states, with k being less than or equal to L-1, and with all the states of all the stages being respectively provided with aggregate metrics;

partitioning into M groups all transitions arriving at the various states of a current stage of the trellis on receipt of a sample of rank n, with each group containing all the transitions arising from the states of a preceding stage which are associated with one of the M possible values of a symbol of rank n-k;

calculating the various aggregate metrics for the various states of a current stage of the trellis;

determining in each group one of the transitions which leads to a state provided with an extremum aggregate metric; and

selecting a unique decision regarding the value of

the symbol of rank n-k by detecting the group associated with the extremum of the M extremum aggregate metrics, the unique decision being provided with a symbol-confidence index formulated from the M extremum aggregate metrics.

49. A process according to Claim 48, wherein the aggregate metrics are error cues aggregated between observed values and expected values of the samples; and wherein the extremum aggregate metric comprises a minimum aggregate metric.

50. A process according to Claim 49, wherein M is equal to 2; and wherein the detecting comprises calculating a difference between the two minimum aggregate metrics, and a sign of the difference yields a unique decision regarding the value of the symbol of rank n-k, and an absolute value of the difference yields a value of the symbol-confidence index.

51. A process according to Claim 49, wherein M is greater than 2; and wherein the detecting comprises making a first selection of the smallest of the M minimum aggregate metrics; and wherein formulating the symbol-confidence index assigned to the unique decision comprises a second selection from among M-1 remaining minimum aggregate metrics not selected on completion of the first selection of the smallest of the M-1 remaining minimum aggregate metrics, and calculation of a difference between the two minimum aggregate metrics arises respectively from the first and second selections, and a positive value of the difference yields the value of the symbol-confidence index.

52. A process according to Claim 48, wherein the aggregate metrics are resemblance cues aggregated between observed values and expected values of the samples; and wherein the extremum aggregate metric comprises a maximum aggregate metric.

53. A process according to Claim 52, wherein M is equal to 2; and wherein the detecting comprises calculating a difference between the two maximum aggregate metrics comprises calculating a difference between the two maximum aggregate metrics, and a sign of the difference yields the unique decision regarding the value of the symbol of rank n-k, and an absolute value of the difference yields the value of the symbol-confidence index.

54. A process according to Claim 52, wherein M is greater than 2; and wherein the detecting comprises making first selection of the largest of the M maximum aggregate metrics; and wherein formulating the symbol-confidence index assigned to the unique decision comprises a second selection from among the M-1 remaining maximum aggregate metrics not selected on completion of the first selection, of the largest of the M-1 remaining maximum aggregate metrics, and the calculation of the difference between the two maximum aggregate metrics arises respectively from the first and second selections, and a positive value of the difference yields the value of the symbol-confidence index.

55. A process according to Claim 48, wherein each symbol is formed of b bits and M is equal to 2^b, and a bit-confidence index is formulated for each of the bits of the

symbol of rank n-k elected on completion of the unique decision by using an elected symbol and at least one auxiliary symbol formulated from the elected symbol by complementing at least a value of a relevant bit.

56. A process according to Claim 55, wherein formulating the bit-confidence index for a relevant bit of the elected symbol comprises:

formulating the at least one single auxiliary symbol by complementing the value of the respective relevant bit while leaving unchanged the values of the other bits of the elected symbol;

selecting at least one extremum aggregate metric associated with the group of transitions to which the at least one auxiliary symbol belongs; and

determining a difference between the at least one extremum aggregate metric associated with the group of transitions to which the elected symbol belongs and to the at least one extremum aggregate metric associated with the group of transitions to which the at least one auxiliary symbol belongs, and a result of the difference yields the value of the bit-confidence index.

57. A process according to Claim 48, wherein the trellis is a reduced trellis with M^k states, with k being less than L-1; and wherein the states of the current stage of rank n of the trellis correspond to the k symbols of rank n to n-k+1, in that after having selected the unique decision regarding the symbol of rank n-k, one tag containing the values of the symbols of rank n-k to n-L+2 respectively obtained upon the L-k-1 selections of successive unique

decisions is associated with all the states of the current stage of the trellis, and in that the aggregate metric of each state of the stage of rank n of the trellis is calculated from a transition metric associated with the transition ending at the state of the stage of rank n and arising from the state of the stage of rank n-1 corresponding to the value of the symbol of rank n-k, contained in the tag, and from the aggregate metric associated with the state of the stage of rank n-1 from which the transition arises.

58. A process according to Claim 57, further comprising filtering the samples received using a filter matched to an impulse response of the transmission channel, and wherein the estimating is performed on the filtered samples.

59. A process according to Claim 48, wherein the stage-by-stage progression through the trellis is conditioned to the selection of successive unique decisions regarding the values of the symbols.

60. A process according to Claim 48, wherein the estimating, partitioning, calculating, determining and selecting are stored as instructions on a computer readable medium for execution by a processor.

61. A device for estimating successive values of digital symbols, with each symbol having M different possible values, the device comprising:

reception means for receiving successive values of digital samples, each sample resulting from a combination of

at most L successive symbols; and

estimation means for estimating the successive values of the symbols based upon a stage-by-stage progression through a trellis of a Viterbi type with M^k states, with k being less than or equal to L-1 and all the states of all the stages being respectively provided with aggregate metrics, said estimation means comprising

partition means for partitioning all the transitions arriving at the various states of a corresponding current stage of the trellis into M groups when taking into account a sample of rank n, each group containing all the transitions arising from the states of a preceding stage associated with one of the M possible values of a symbol of rank n-k,

calculation means for calculating the various aggregate metrics for the various states of the current stage of the trellis,

determination means connected to said partition means and to said calculation means for determining in each group one of the transitions which leads to the state provided with an extremum aggregate metric,

decision selection means connected to said determination means for selecting a unique decision regarding the value of the symbol of rank n-k by detecting the group associated with the extremum of the M extremum aggregate metrics, and

first formulation means connected to said decision selection means for formulating from the M extremum aggregate metrics a symbol-confidence index

assigned to the unique decision.

62. A device according to Claim 61, wherein the aggregate metrics are error cues aggregated between observed values and expected values of the samples; and wherein the extremum aggregate metric comprises a minimum aggregate metric.

63. A device according to Claim 62, wherein M is equal to 2; and wherein said first formulation means comprises a subtractor for calculating a difference between the two minimum aggregate metrics, and a sign of the difference yields the unique decision regarding the value of the symbol of rank n-k, and an absolute value of the difference calculated by said subtractor yields the value of the symbol-confidence index.

64. A device according to Claim 62, wherein M is greater than 2; and wherein said decision selection means comprises first selection means for performing a first selection of a smallest of the M minimum aggregate metrics; and wherein said first formulation means comprises:

second selection means for performing a second selection, from among the M-1 minimum aggregate metrics not selected on completion of the first selection, of the smallest of the M-1 remaining minimum aggregate metrics; and

a subtractor connected to said second selection means for calculating the difference between the two minimum aggregate metrics respectively arising from the first and second selections, and a positive value of the difference yields the value of the symbol-confidence index.

65. A device according to Claim 61, wherein the aggregate metrics are resemblance cues aggregated between observed values and expected values of the samples; and wherein the extremum aggregate metric comprises a maximum aggregate metric.

66. A device according to Claim 65, wherein M is equal to 2; and wherein said first formulation means comprises a subtractor for calculating a difference between the two maximum aggregate metrics, and a sign of the difference yields the unique decision regarding the value of the symbol of rank n-k, and an absolute value of the difference calculated by said subtractor yields the value of the symbol-confidence index.

67. A device according to Claim 65, wherein M is greater than 2; and wherein said decision selection means comprises first selection means for performing a first selection of the largest of the M maximum aggregate metrics; and wherein said first formulation means comprises:

second selection means for performing a second selection, from among the M-1 remaining maximum aggregate metrics not selected on completion of the first selection, of the largest of the M-1 remaining maximum aggregate metrics; and

a subtractor connected to said second selection means for calculating a difference between the two maximum aggregate metrics respectively arising from the first and second selections, and a positive value of the difference yields the value of the symbol-confidence index.

68. A device according to Claim 61, wherein each symbol is formed of b bits, with M being equal to 2^b; and wherein said first formulation means further comprises second formulation means for formulating a bit-confidence index for each of the bits of the symbol of rank n-k elected on completion of the unique decision, by using the elected symbol and at least one auxiliary symbol formulated from the elected symbol by complementing at least a value of a relevant bit.

69. A device according to Claim 68, wherein said second formulation means comprises:

auxiliary formulation means for formulating at least one single auxiliary symbol by complementing the respective value of the relevant bit while leaving unchanged the values of the other bits of the elected symbol;

auxiliary selection means connected to said auxiliary formulation means for selecting the at least one extremum aggregate metric associated with the group of transitions to which the auxiliary symbol belongs; and

an auxiliary subtractor connected to said auxiliary selection means for calculating the difference between the at least one extremum aggregate metric associated with the group of transitions to which the elected symbol belongs and the at least one extremum aggregate metric associated with the group of transitions to which the auxiliary symbol belongs, and a result of the difference yields the value of the bit-confidence index.

70. A device according to Claim 61, wherein the trellis is a reduced trellis with M^k states, with k being less than L-1; and wherein the states of the current stage of rank

n of the trellis correspond to assumptions regarding the k symbols of rank n to n-k+1, in that said decision selection means selects a unique decision regarding the symbol of rank n-k, in that said estimation means associates a same tag containing the values of the symbols of rank n-k to n-L+2 respectively obtained upon the L-k-1 selections of successive unique decisions delivered by said decision selection means with all the states of the current stage of the trellis, and said calculation means calculates the aggregate metric of each state of the stage of rank n of the trellis from the transition metric associated with the transition ending up at the state of the stage of rank n and arising from the state of the stage of rank n-1 corresponding to the value of the symbol of rank n-k contained in the tag, and from the aggregate metric associated with the state of the stage of rank n-1 from which the transition arises.

71. A device according to Claim 61, wherein said reception means and said estimation means are configured as a digital receiver for a cellular telephone.

72. A device for equalizing an information transmission channel, the device comprising:

a memory for storing L coefficients representative of an impulse response of the transmission channel;

reception means for receiving successive digital samples corresponding to successively transmitted symbols, each symbol having M different possible values; and

an equalization circuit comprising estimation means for estimating the successive values of the symbols based upon a stage-by-stage progression through a trellis of a Viterbi

type with M^k states, with k being less than or equal to L-1 and all the states of all the stages being respectively provided with aggregate metrics, said estimation means comprising

partition means for partitioning all transitions arriving at the various states of a corresponding current stage of the trellis into M groups on receipt of a sample of rank n, each group containing all the transitions arising from the states of a preceding stage which are associated with one of the M possible values of the symbol of rank n-k,

calculation means for calculating the various aggregate metrics for the various states of the current stage of the trellis,

determination means connected to said partition means and to said calculation means for determining in each group one of the transitions which leads to the state provided with an extremum aggregate metric,

decision selection means connected to said determination means for selecting a unique decision regarding the value of the symbol of rank n-k by detecting the group associated with an extremum of M extremum aggregate metrics, and

first formulation means connected to said decision selection means for formulating from the M extremum aggregate metrics a symbol-confidence index assigned to this unique decision.

73. A device according to Claim 72, wherein the aggregate metrics are error cues aggregated between observed

values and expected values of the samples; and wherein the extremum aggregate metric comprises a minimum aggregate metric.

74. A device according to Claim 73, wherein M is equal to 2; and wherein said first formulation means comprises a subtractor for calculating a difference between the two minimum aggregate metrics, and a sign of the difference yields the unique decision regarding the value of the symbol of rank n-k, and an absolute value of the difference calculated by said subtractor yields the value of the symbol-confidence index.

75. A device according to Claim 73, wherein M is greater than 2; and wherein said decision selection means comprises first selection means for performing a first selection of a smallest of the M minimum aggregate metrics; and wherein said first formulation means comprises:

second selection means for performing a second selection, from among the M-1 minimum aggregate metrics not selected on completion of the first selection, of the smallest of the M-1 remaining minimum aggregate metrics; and

a subtractor connected to said second selection means for calculating the difference between the two minimum aggregate metrics respectively arising from the first and second selections, and a positive value of the difference yields the value of the symbol-confidence index.

76. A device according to Claim 72, wherein the aggregate metrics are resemblance cues aggregated between observed values and expected values of the samples; and

wherein the extremum aggregate metric comprises a maximum aggregate metric.

77. A device according to Claim 76, wherein M is equal to 2; and wherein said first formulation means comprises a subtractor for calculating a difference between the two maximum aggregate metrics, and a sign of the difference yields the unique decision regarding the value of the symbol of rank n-k, and an absolute value of the difference calculated by said subtractor yields the value of the symbol-confidence index.

78. A device according to Claim 76, wherein M is greater than 2; and wherein said decision selection means comprises first selection means for performing a first selection of the largest of the M maximum aggregate metrics; and wherein said first formulation means comprises:

second selection means for performing a second selection, from among the M-1 remaining maximum aggregate metrics not selected on completion of the first selection, of the largest of the M-1 remaining maximum aggregate metrics; and

a subtractor connected to said second selection means for calculating a difference between the two maximum aggregate metrics respectively arising from the first and second selections, and a positive value of the difference yields the value of the symbol-confidence index.

79. A device according to Claim 72, wherein each symbol is formed of b bits, with M being equal to 2^b; and wherein said first formulation means further comprises second

formulation means for formulating a bit-confidence index for each of the bits of the symbol of rank n-k elected on completion of the unique decision, by using the elected symbol and at least one auxiliary symbol formulated from the elected symbol by complementing at least a value of a relevant bit.

80. A device according to Claim 79, wherein said second formulation means comprises:

auxiliary formulation means for formulating at least one single auxiliary symbol by complementing the respective value of the relevant bit while leaving unchanged the values of the other bits of the elected symbol;

auxiliary selection means connected to said auxiliary formulation means for selecting the at least one extremum aggregate metric associated with the group of transitions to which the auxiliary symbol belongs; and

an auxiliary subtractor connected to said auxiliary selection means for calculating the difference between the at least one extremum aggregate metric associated with the group of transitions to which the elected symbol belongs and the at least one extremum aggregate metric associated with the group of transitions to which the auxiliary symbol belongs, and a result of the difference yields the value of the bit-confidence index.

81. A device according to Claim 72, wherein the trellis is a reduced trellis with M^k states, with k being less than L-1; and wherein the states of the current stage of rank n of the trellis correspond to assumptions regarding the k symbols of rank n to n-k+1, in that said decision selection means selects a unique decision regarding the symbol of rank

n-k, in that said estimation means associates a same tag containing the values of the symbols of rank n-k to n-L+2 respectively obtained upon the L-k-1 selections of successive unique decisions delivered by said decision selection means with all the states of the current stage of the trellis, and said calculation means calculates the aggregate metric of each state of the stage of rank n of the trellis from the transition metric associated with the transition ending up at the state of the stage of rank n and arising from the state of the stage of rank n-1 corresponding to the value of the symbol of rank n-k contained in the tag, and from the aggregate metric associated with the state of the stage of rank n-1 from which the transition arises.

82. A device according to Claim 81, wherein said equalization means further comprises a filter matched to the impulse response of the transmission channel.

83. A device according to Claim 72, wherein said memory, reception means and said equalization circuit are configured as a digital receiver for a cellular telephone.

84. A device for estimating successive values of digital symbols, with each symbol having M different possible values, the device comprising:

a reception circuit for receiving successive values of digital samples, each sample resulting from a combination of at most L successive symbols; and

an estimation circuit for estimating the successive values of the symbols based upon a stage-by-stage progression through a trellis of a Viterbi type with M^k states, with k

being less than or equal to L-1 and all the states of all the stages being respectively provided with aggregate metrics, said estimation circuit comprising

a partition circuit for partitioning all the transitions arriving at the various states of a corresponding current stage of the trellis into M groups when taking into account a sample of rank n, each group containing all the transitions arising from the states of a preceding stage associated with one of the M possible values of a symbol of rank n-k,

a calculation circuit for calculating the various aggregate metrics for the various states of the current stage of the trellis,

a determination circuit connected to said partition circuit and to said calculation circuit for determining in each group one of the transitions which leads to the state provided with an extremum aggregate metric,

a decision selection circuit connected to said determination circuit for selecting a unique decision regarding the value of the symbol of rank n-k by detecting the group associated with the extremum of the M extremum aggregate metrics, and

a first formulation circuit connected to said decision selection circuit for formulating from the M extremum aggregate metrics a symbol-confidence index assigned to the unique decision.

85. A device according to Claim 84, wherein the aggregate metrics are error cues aggregated between observed

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values and expected values of the samples; and wherein the extremum aggregate metric comprises a minimum aggregate metric.

86. A device according to Claim 84, wherein the aggregate metrics are resemblance cues aggregated between observed values and expected values of the samples; and wherein the extremum aggregate metric comprises a maximum aggregate metric.

87. A device according to Claim 84, wherein each symbol is formed of b bits, with M being equal to 2^b; and wherein said first formulation circuit further comprises a second formulation circuit for formulating a bit-confidence index for each of the bits of the symbol of rank n-k elected on completion of the unique decision, by using the elected symbol and at least one auxiliary symbol formulated from the elected symbol by complementing at least a value of a relevant bit.

88. A device according to Claim 84, wherein the trellis is a reduced trellis with M^k states, with k being less than L-1.

89. A device according to Claim 84, wherein said reception circuit and said estimation circuit are configured as a digital receiver for a cellular telephone.

90. A device for equalizing an information transmission channel, the device comprising:

a memory for storing L coefficients representative

of an impulse response of the transmission channel;

a reception circuit for receiving successive digital samples corresponding to successively transmitted symbols, each symbol having M different possible values; and

an equalization circuit comprising an estimation circuit for estimating the successive values of the symbols based upon a stage-by-stage progression through a trellis of a Viterbi type with M^k states, with k being less than or equal to L-1 and all the states of all the stages being respectively provided with aggregate metrics, said estimation circuit comprising

a partition circuit for partitioning all transitions arriving at the various states of a corresponding current stage of the trellis into M groups on receipt of a sample of rank n, each group containing all the transitions arising from the states of a preceding stage which are associated with one of the M possible values of the symbol of rank n-k,

a calculation circuit for calculating the various aggregate metrics for the various states of the current stage of the trellis,

a determination circuit connected to said partition circuit and to said calculation circuit for determining in each group one of the transitions which leads to the state provided with an extremum aggregate metric,

a decision selection circuit connected to said determination circuit for selecting a unique decision regarding the value of the symbol of rank n-k by detecting the group associated with an

extremum of M extremum aggregate metrics, and

a first formulation circuit connected to said decision selection circuit for formulating from the M extremum aggregate metrics a symbol-confidence index assigned to this unique decision.

91. A device according to Claim 90, wherein the aggregate metrics are error cues aggregated between observed values and expected values of the samples; and wherein the extremum aggregate metric comprises a minimum aggregate metric.

92. A device according to Claim 90, wherein the aggregate metrics are resemblance cues aggregated between observed values and expected values of the samples; and wherein the extremum aggregate metric comprises a maximum aggregate metric.

93. A device according to Claim 90, wherein each symbol is formed of b bits, with M being equal to 2^b; and wherein said first formulation circuit further comprises a second formulation circuit for formulating a bit-confidence index for each of the bits of the symbol of rank n-k elected on completion of the unique decision, by using the elected symbol and at least one auxiliary symbol formulated from the elected symbol by complementing at least a value of a relevant bit.

94. A device according to Claim 90, wherein the trellis is a reduced trellis with M^k states, with k being less than L-1.

95. A device according to Claim 90, wherein said memory, reception circuit and said equalization circuit are configured as a digital receiver for a cellular telephone.

REMARKS

It is believed that all of the claims are patentable over the prior art. For better readability and the Examiner's convenience, the newly submitted claims differ from the translated counterpart claims which are being canceled. The newly submitted claims do not represent changes or amendments that narrow the claim scope for any reason related to the statutory requirements for patentability. Accordingly, after the Examiner completes a thorough examination and finds the claims patentable, a Notice of Allowance is respectfully requested in due course. Should the Examiner determine any minor informalities that need to be addressed, he is encouraged to contact the undersigned attorney at the telephone number below.

Respectfully submitted,

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FIG.8

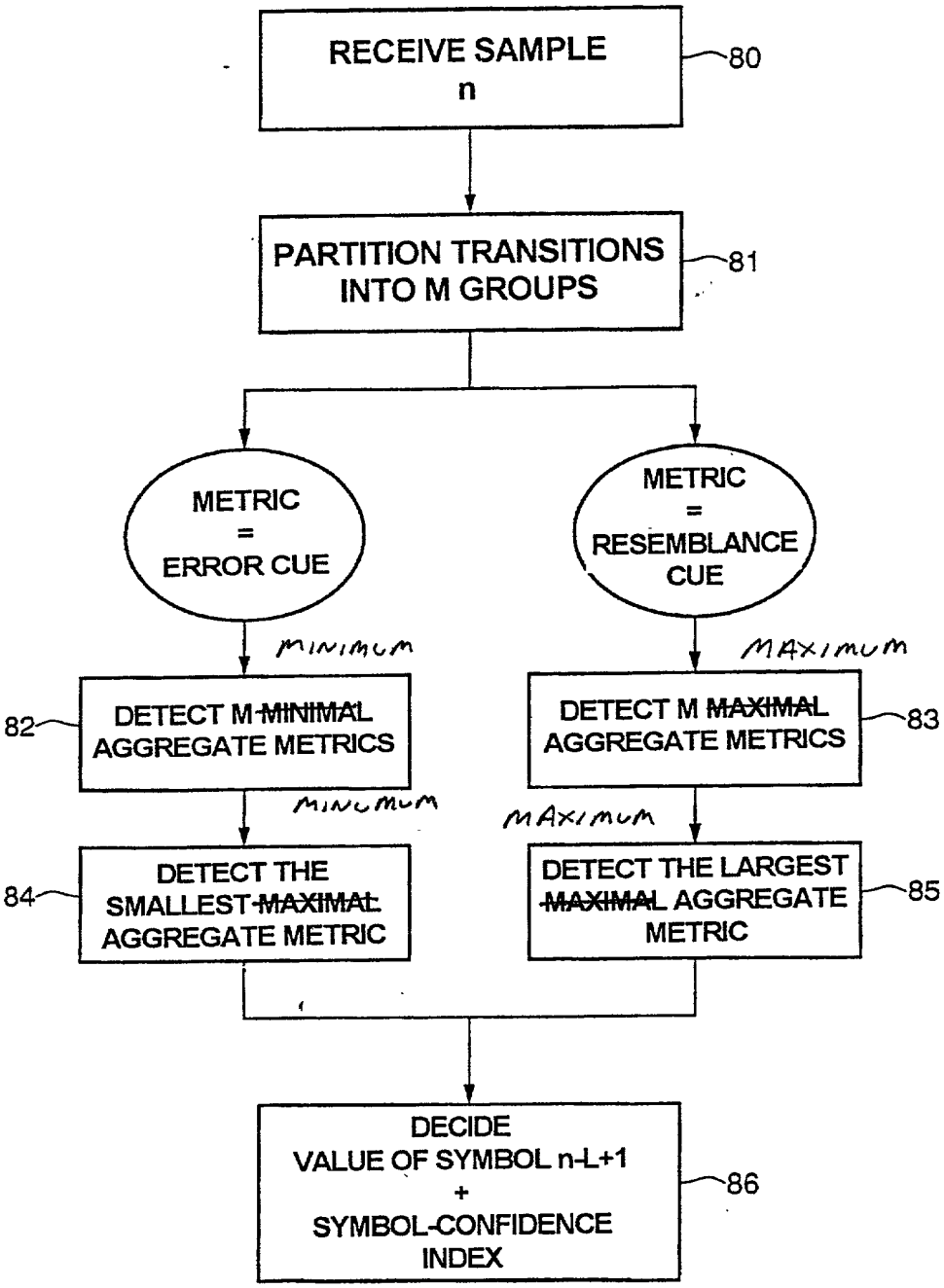
RECEIVE SAMPLE
n
80
PARTITION TRANSITIONS INTO M GROUPS
81
METRIC = ERROR CUE
METRIC = RESEMBLANCE CUE
MINIMUM
MAXIMUM
82
DETECT M ~~MINIMAL~~ AGGREGATE METRICS
DETECT M ~~MAXIMAL~~ AGGREGATE METRICS
83
MINIMUM
MAXIMUM
84
DETECT THE SMALLEST ~~MAXIMAL~~ AGGREGATE METRIC
DETECT THE LARGEST ~~MAXIMAL~~ AGGREGATE METRIC
85
DECIDE VALUE OF SYMBOL n-L+1 + SYMBOL-CONFIDENCE INDEX
86

FIG.12

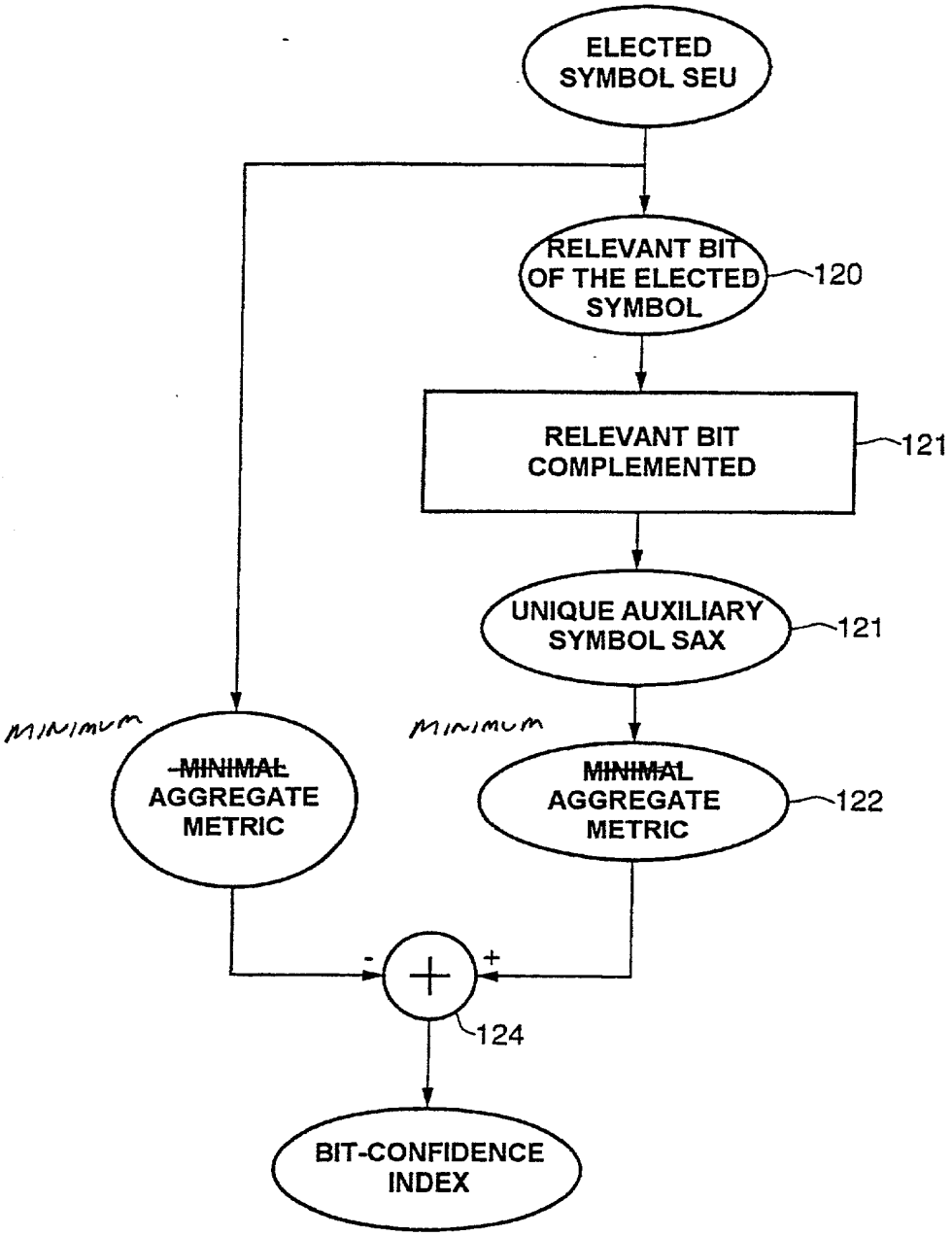
ELECTED SYMBOL SEU
RELEVANT BIT OF THE ELECTED SYMBOL
120
RELEVANT BIT COMPLEMENTED
121
UNIQUE AUXILIARY SYMBOL SAX
121
MINIMUM
~~MINIMAL~~ AGGREGATE METRIC
MINIMUM
~~MINIMAL~~ AGGREGATE METRIC
122
-
+
124
BIT-CONFIDENCE INDEX

FIG.13

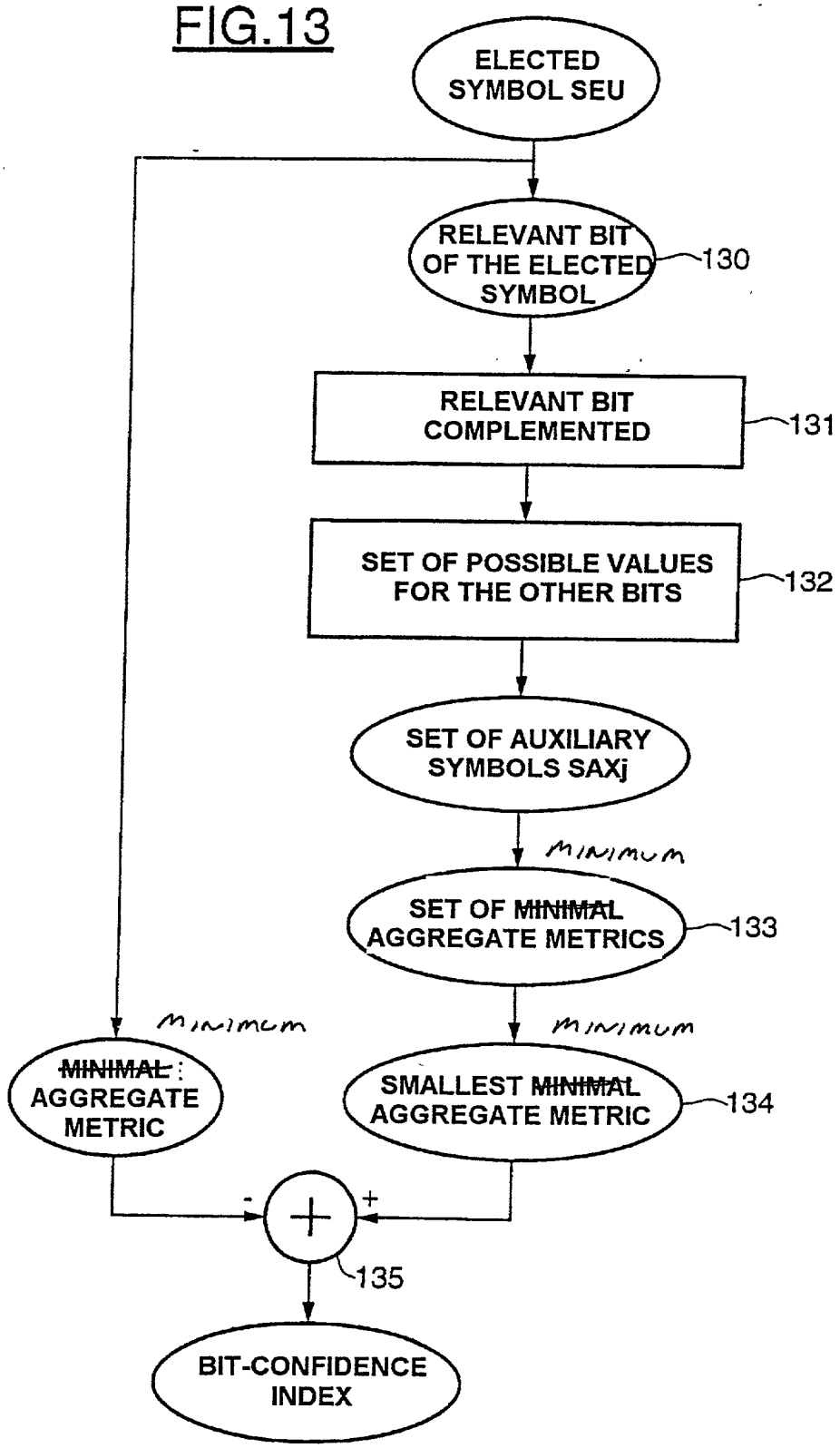
ELECTED SYMBOL SEU
RELEVANT BIT OF THE ELECTED SYMBOL
130
RELEVANT BIT COMPLEMENTED
131
SET OF POSSIBLE VALUES FOR THE OTHER BITS
132
SET OF AUXILIARY SYMBOLS SAXj
MINIMUM
SET OF ~~MINIMAL~~ AGGREGATE METRICS
133
MINIMUM
MINIMUM
~~MINIMAL~~ : AGGREGATE METRIC
SMALLEST ~~MINIMAL~~ AGGREGATE METRIC
134
-
+
135
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FIG.14

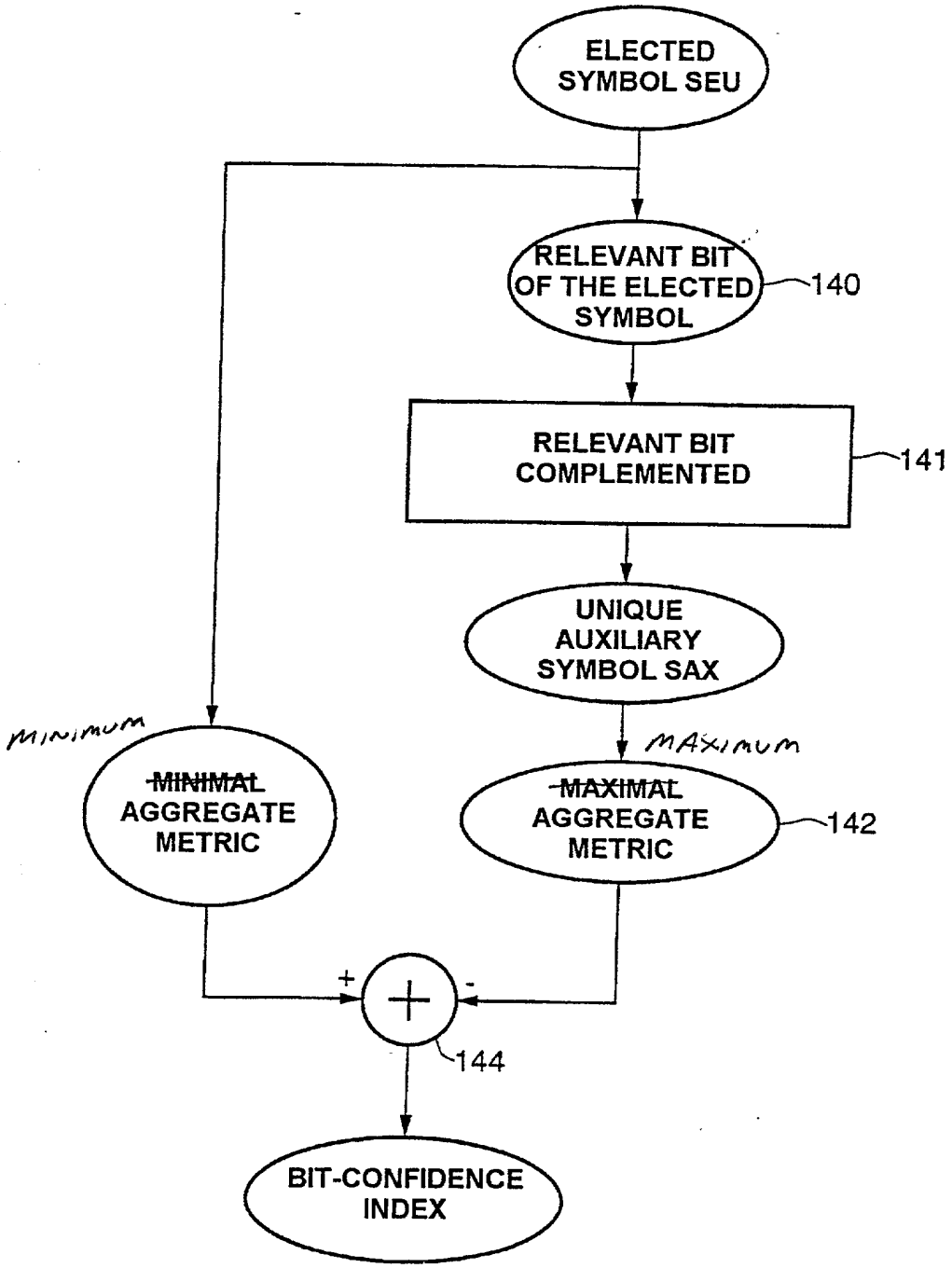
ELECTED SYMBOL SEU
RELEVANT BIT OF THE ELECTED SYMBOL
140
RELEVANT BIT COMPLEMENTED
141
UNIQUE AUXILIARY SYMBOL SAX
MINIMUM
MAXIMUM
MINIMAL AGGREGATE METRIC
MAXIMAL AGGREGATE METRIC
142
+
-
144
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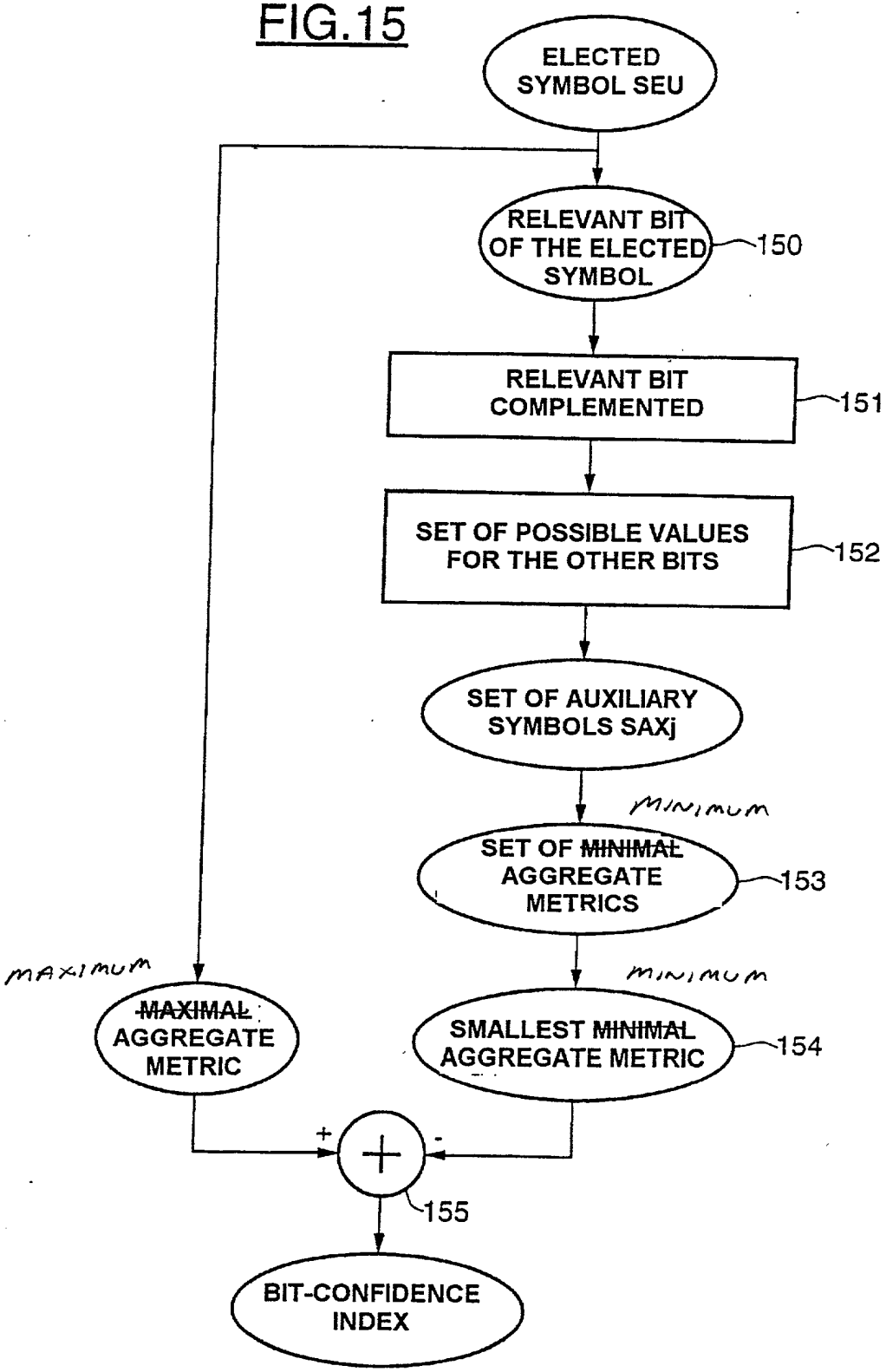
FIG.15


ELECTED SYMBOL SEU
RELEVANT BIT OF THE ELECTED SYMBOL
150
RELEVANT BIT COMPLEMENTED
151
SET OF POSSIBLE VALUES FOR THE OTHER BITS
152
SET OF AUXILIARY SYMBOLS SAXj
MINIMUM
SET OF ~~MINIMAL~~ AGGREGATE METRICS
153
MINIMUM
SMALLEST ~~MINIMAL~~ AGGREGATE METRIC
154
MAXIMUM
~~MAXIMAL~~ AGGREGATE METRIC
+
-
155
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